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ABSTRACT

The Defense Technical Information Center (DTIC), an organization charged with providing information services to the Department of Defense (DoD) scientific and technical community, actively seeks ways to promote resource sharing as a means for speeding access to information while reducing the costs of information processing throughout the technical library community. To achieve this goal, DTIC is sponsoring the development of an integrated bibliographic information system (IBIS). The system prototype, which has been under development since April 1983, will be used to demonstrate the concept of an integrated library system combined with an intelligent gateway capable of simultaneously querying and updating more than one heterogeneous bibliographic database (catalog) using a common command language. A discussion of the project includes the project background; DoD library environment; development approach; information processing concepts and technologies investigated and selected for implementation in the prototype system; and issues underpinning system implementation. Considerations for the future include devising an acquisition strategy, developing a standard or common set of index terms and controlled subject terms for shared cataloging and retrieval; developing a microcomputer-based version of the IBIS; and expanding the number of databases that can be accessed and queried using the common command language. (Author/KM)

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INTEGRATED BIBLIOGRAPHIC INFORMATION SYSTEM: INTEGRATING RESOURCES BY INTEGRATING INFORMATION TECHNOLOGIES

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The Defense Technical Information Center (DTIC) is charged with providing information services to the Department of Defense scientific and technical community. These services range from collecting and disseminating bibliographic information to sponsoring and directing research into innovative information handling technologies. Through this research, DTIC actively seeks ways to promote resource sharing as a means for speeding access to information while reducing the costs of information processing throughout the technical library community. To achieve this goal, DTIC is sponsoring the development of an integrated bibliographic information system. The prototype of this system, under development since April 1983, will be used to demonstrate the concept of an integrated library system combined with an intelligent gateway capable of querying and updating -- simultaneously -- more than one heterogeneous bibliographic data base (catalog). Queries and updates of any data base will be performed using a common command language, relieving the system user of the need to learn and master separate languages and procedures for each data base accessed.

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Integrated Bibliographic Information System:

Integrating Resources by Integrating Information Technologies

by

Gladys A. Cotter and Richard W. Hartt

Keywords: Resource Sharing, Integrated Library System, Intelligent Gateway, Common Command Language, User Interface, Bibliographic Data Bases, Downloading, Networking.

Abstract: The Defense Technical Information Center (DTIC) is charged with providing information services to the Department of Defense scientific and technical community. These services range from collecting and disseminating bibliographic information to sponsoring and directing research into innovative information handling technologies. Through this research, DTIC actively seeks ways to promote resource sharing as a means for speeding access to information while reducing the costs of information processing throughout the technical library community. To achieve this goal, DTIC is sponsoring the development of an integrated bibliographic information system. The prototype of this system, under development since April 1983, will be used to demonstrate the concept of an integrated library system combined with an intelligent gateway capable of querying and updating -- simultaneously -- more than one heterogeneous bibliographic data base (catalog). Queries and updates of any data base will be performed using a common command language, relieving the system user of the need to learn and master separate languages and procedures for each data base accessed. The development approach used, the information processing concepts and technologies investigated and selected for implementation in the prototype system, and the issues underpinning system implementation are described.

1. BACKGROUND

The Defense Technical Information Center (DTIC) has the mission to develop a coordinated scientific and technical information network to support the Department of Defense (DoD) research, development, engineering, and studies programs. DoD libraries and information centers form the backbone of this network. It is through these libraries and information centers, serving as intermediaries, that DTIC distributes technical information to its end-user community, the DoD researcher.

In recognition of the importance of these institutions, DTIC is charged with providing a focus for developing and coordinating programs among, and providing centralized technical support to, DoD technical libraries. To this end, DTIC provides systems development and research into new information technologies which appear to offer significant benefits to the

library community. The underlying philosophy of these efforts is the concept of "resource sharing." DTIC seeks to provide systems which will allow libraries to make maximum use of existing information, tailor this information to meet local needs and share newly generated information with other members of the network.

An early project which DTIC sponsored in this area is the Shared Bibliographic Input Network (SBIN). Libraries participating in SBIN use the Defense RDT&E Online System (DROLS) for shared cataloging of their technical reports in much the same manner that they use OCLC for cataloging their book collection. With DROLS, users access the Technical Reports (TR) data base, a central, online catalog of over 1.5 million citations to technical reports produced by the DoD and DoD contractors. Participating libraries can catalog into and retrieve bibliographic citations from the TR data base. When a library finds that the cataloging data for a technical report it holds is already in the TR data base, they simply append a holdings indicator. If the cataloging data is not in the system, and the report is within scope of the data base, the library creates and enters the citation, making it available to the entire network immediately.

2. DOD LIBRARY ENVIRONMENT

Over 500 technical libraries and information centers currently operate throughout the U.S. supporting the DoD research centers and laboratories conducting research projects. While the technical libraries all operate within the DoD, each library is unique in responding to the management direction and patron needs of the laboratory or research center supported. Each library reflects the emphasis and orientation of the research work supported, resulting in a wide range of library sizes, a variety of operating conditions and methods, and diverse, unique local collections. What these libraries have in common are: (1) local collections consisting largely of scientific and technical reports (some of which are classified and restricted in availability) combined with monographs and serials; (2) a central source within the DoD for technical reports, the DTIC; and, (3) a need to combine local collection bibliographic resources with commercially available resources related to science, technology, engineering, and other general research areas.

Despite the diversity in organization, management, and patron orientation, technical libraries perform the same basic functions as any other library: cataloging, reference, circulation management and control. A local collection, tailored to patron needs, provides the core resources. In general, all DoD technical libraries rely on the DTIC TR data base as the online reference source of DoD-related technical report citations. In addition, most libraries rely on commercial bibliographic sources -- DIALOG, LEXIS/NEXIS, OCLC, BRS, ORBIT -- and other government data bases -- chiefly NASA RECON and DOE RECON -- to meet patron demands for information. Regardless of the size, each technical library must maintain and exercise a range of bibliographic resources to meet patron needs.

Blending together the mix of resources required by DoD technical libraries complicates the process of developing automated systems to support

library operations. While the process is further complicated by the nature of the local collection -- technical reports versus monographs, restricted versus open access to holdings -- there are clear advantages to pursuing integrated systems for technical library automation. Through integration, local collection access can be linked with access to external resources -- government or commercial -- providing a powerful reference tool well-suited to meet the special demands of closed and open literature access. Manual and intellectual effort spent on cataloging locally published technical reports can be shared with other libraries through shared cataloging. That is, given that the citation is created and entered into a local catalog, the computer can be used to translate or reformat the citation (generally necessary because of different catalog formats and cataloging rules) and transmit the citation to a central catalog such as the DTIC TR data base. Once entered into the TR data base, other members of the technical and scientific community have almost immediate access to the latest research results.

The challenge in developing and implementing automated systems for DoD technical libraries centers on integrating local collection management functions (reference, cataloging, and circulation) with access to external resources (both for reference and shared cataloging). Under this concept of an integrated system, library staff members can effectively and economically provide comprehensive, broad-based reference services taking advantage of diverse resources. Through participation in shared cataloging, they can also accomplish timely dissemination of current research results by taking full advantage of local library resources and eliminating duplication of intellectual and manual efforts in the cataloging process.

3. APPROACH

The project was structured in phases consistent with a typical automated system development life cycle: requirements definition, concept development, system design, concept demonstration, system evaluation, system acquisition and implementation, and system operation and maintenance. The results of the project will be a system available for purchase by Federal libraries. User feedback and acceptance was considered essential to the success of the project. At each stage of the project, commentary was solicited from selected libraries and members of DTIC's Resource Sharing Advisory Group. The Information Systems Group of the Logistics Management Institute is providing technical assistance to DTIC for system development. Work on requirements definition began in November 1982, with concept demonstration -- implementation of a prototype system -- scheduled for June 1985.

Requirements definition began with visits to representative libraries to conduct interviews with staff members. A survey questionnaire, consisting of system requirements and features, was prepared and distributed to participating libraries. Survey respondents selected the requirements and features in order of priority of need.

Based on the requirements and priorities established through the survey, a design concept for the system was formulated. The design concept

described the requirements to be included in the system and laid out a structure for the system. The design concept was documented and sent to survey respondents for comment. Comments were incorporated in subsequent design work on the system.

Design of the system continued with development and publication of a functional description. The purpose of this document was to convey to the user community and potential system developers the characteristics and performance of the system. Within the functional description, the software architecture for the system was defined. The operating environment was discussed along with a statement of hardware features and characteristics needed to operate the system. As before, the document was sent to participating technical libraries for review and comment.

At this point, the general system characteristics and capabilities were fairly well agreed upon. The processing steps and hardware and software requirements were then documented in a system specification. The system specification described the detailed processing steps and sequences required to meet user requirements.

On the basis of the requirements and design documented for the system, a survey of available software products was conducted to ascertain the suitability of using existing, commercially available systems for the prototype. A list of 30 critical functions was developed and used to conduct the survey. In all, 66 vendors were contacted. In the first stage of the survey, 36 products were eliminated from consideration, leaving 30 vendors as possible candidates pending further evaluation. Of the remaining 30, six were finally selected as having suitable functionality and offering the requisite features for the prototype system.

Performance benchmarking will be used to select a package from among the final six for prototype system implementation. Once selected, the commercial package will serve as the core for the system, performing functions supporting local collection management. Other required features will be integrated with this core.

To provide access to external sources, in addition to the local catalog, an intelligent gateway processor will be incorporated in the system. For the prototype system, a subset of the Integrated Information System (IIS) -- developed and supported by the Technology Information System group at Lawrence Livermore National Laboratory -- will be used. Lawrence Livermore staff members are participating in the prototype development, providing much of the technical and operational expertise required for software benchmarking, package selection, and, of course, gateway integration with the selected package.

The prototype system will be installed and operated for 6 months for the express purpose of evaluating and demonstrating the system concept. During that time, a request for proposals (RFP) will be developed to acquire the production system. The ultimate objective of the project is to put a simple mechanism into place through which DoD libraries can acquire the system. At present, utilization of the Federal Library and Information Network (FEDLINK) for this purpose is being explored.

4. INTEGRATED BIBLIOGRAPHIC INFORMATION SYSTEM (IBIS) CHARACTERISTICS

The major requirements for the system were derived from surveys, site visits, and staff interviews conducted throughout the technical library community and are summarized as follows.

4.1 Local Collection Management

Cataloging, retrieval, and circulation capabilities were considered essential. Acquisition and serials management functions were considered desirable features which could be added at a later date.

4.2 External Data Base Access

The capabilities to input data to and retrieve data from external data bases were critical. Uploading and downloading capabilities were considered essential.

4.3 Integration of Local Collection Management and External Data Base Access Capabilities

These capabilities needed to be resident on one computer and accessible by an authorized user over a single video display terminal.

4.4 Common Command Set for Performing Functions Locally or Externally

Learning and executing multiple command sets for inputting and retrieving data were considered unacceptable. A single command structure was needed by the user. The IBIS would be required to perform the necessary protocol translations between the single command structure internal to IBIS and the diverse command structures of the external data bases. The common command set will relieve the user of the need to learn and master separate languages and procedures for each data base accessed.

4.5 Simultaneous Access to External Data Sources and the Local Catalog for Reference Searching

The libraries want to be able to run the same search query against multiple data bases, local and external, simultaneously. Search results are to be delivered to a single terminal.

4.6 Post-processing of Retrieved Data

The ability to reformat, merge, and sort data downloaded from external sources was among the features desired. This capability would allow libraries to tailor search results -- derived from external sources and a local catalog -- to their patron's needs and deliver a single product in an economical and efficient manner.

4.7 Flexible Local Catalog Format

The diverse catalog formats utilized throughout the DoD community

mandate that the IBIS format must be flexible if it is to be widely implemented. Through this approach the issue of cataloging standardization within the DoD community is avoided.

4.8 Machine-Aided Citation Translation and Uploading to DTIC

The IBIS must assist in translating bibliographic citations from the local file format into the DTIC format. This capability will allow DoD libraries to contribute data to the DTIC TR data base in an economic and efficient manner. The information will then be available to the entire DoD community for display and downloading. The resulting shared cataloging will significantly contribute to meeting the resource sharing goals set by DoD.

4.9 Patron Access

DoD libraries often have restricted-access information in their local catalog. For this reason, mechanisms must be built into the IBIS which will verify patron "need-to-know" before displaying information.

All the technologies (software, hardware, and telecommunications) to meet the requirements for the IBIS already exist. Successful completion of the IBIS is dependent on modifying (as required) and assembling these technolo- gies into a truly integrated system running on one computer and accessible by any user over a single terminal.

5.0 STATUS

Performance benchmarking is currently under way to select a commercially available library package for the prototype system. Once selected, the commercial package will be integrated with the gateway software so that both sets of capabilities will be available to the system user. Concurrently, requirements for a user interface to support the single command language concept for searching heterogeneous data bases are being developed. Initially, the user interface will be limited to providing access to three or four diverse data bases in the prototype implementation.

The prototype will be implemented on a minicomputer located at the Defense Nuclear Agency (DNA) in Alexandria, Virginia. The following hardware configuration is required to implement the prototype:

- Two megabytes of main (real) memory
- 600 megabytes of online disk storage capacity
- Operator's console/terminal
- One high-speed line printer located with the computer
- Communications controller/multiplexer for local terminal and printer network

- 4800 baud local terminal and printer network capable of handling data classified up to SECRET

- Five video display terminals each with low-speed printers located in the technical library

- Two video display terminals and one low-speed printer located in the office of the Director, Technical Information, DNA

- Encryption gear and modem for the DROLS classified line (installed in the technical library).

While prototype development is well under way, other significant milestones remain. Some of these will be accomplished within 6 to 12 months; others, because of greater complexity and broader impact, may take longer. For example:

- A plan for acquiring the production system must be developed which accommodates the organizational and managerial diversity found within the DoD technical library community. The acquisition strategy must emphasize competition among the host of potential vendors, but must promote open access to technical data covering protected software so that integrated products can be delivered.

- A standard or common set of index terms and controlled subject terms should be developed for shared cataloging and retrieval within DoD activities and organizations. A vocabulary exists today and is in use by DTIC. However, technical libraries argue that the terms are too broad for use in local collection cataloging or retrieval where a single DTIC term can cover 10 to 25 percent of a local collections's holdings.

- A microcomputer-based version of the IBIS is desired. The challenge becomes one of scaling the software and hardware so that a system, with required features and capabilities, is available for implementation -- economically -- within any size library or information center.

- The number of data bases which can be accessed and queried using the common command language can be expanded beyond the few selected for prototype system implementation.

Implementation of the prototype will demonstrate the feasibility of integrating diverse yet functionally compatible automation resources for special libraries. Ensuring widest possible access to the results of the IBIS project -- a production system -- enables individual technical libraries to improve patron services with a reasonable rate of return on system costs and without the risks of going it alone for system development. For the DoD scientific and technical community, implementation of the production system provides a powerful, responsive information management tool supporting timely, comprehensive research, development, and engineering.